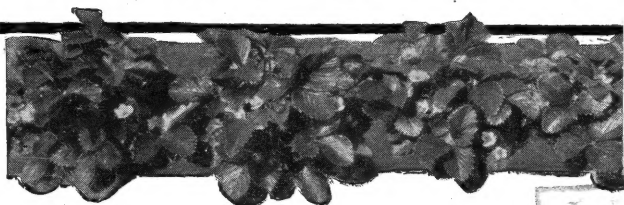


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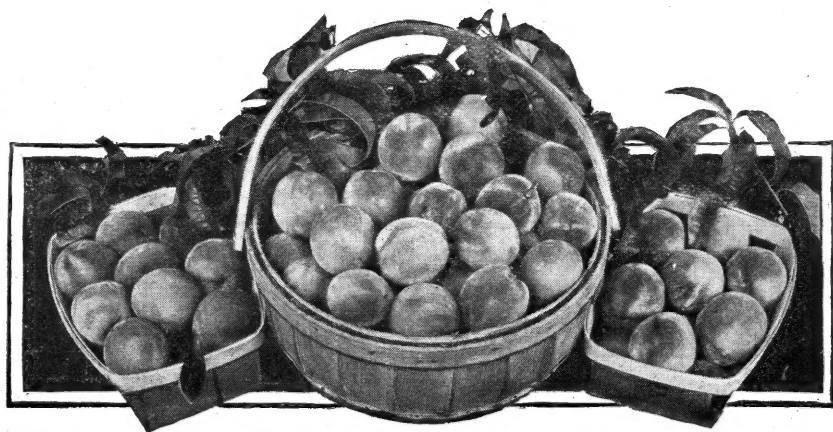


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Growing Fruit

for Home Use



WELL-RIPENED sound fruit is healthful. It is also a valuable food. It should form a part of every meal, fresh when possible, or dried, canned, or otherwise preserved.

Home-grown fruit is desirable—

Because it reaches the family fresh and in the best possible condition.

Because the family has fruit of which it would often be deprived if it had to be purchased.

Because, if the proper varieties be selected, a continuous supply of fruit of superior quality may be secured, regardless of market prices.

Because any surplus may be sold without difficulty, or may be canned, evaporated, or otherwise conserved for use when fresh fruit is not available.

Because the care of the home fruit garden provides for spare time congenial and profitable occupation which is in reality recreation for those who enjoy seeing things grow.

This bulletin aims to furnish, in concise form, information that will be of practical help to the beginner in fruit growing.

It deals with the widely grown temperate-climate fruits, such as the apple, pear, peach, and plum. Lists of desirable varieties of these fruits are given for the different parts of the country.

Because of the number of fruits considered and the territory covered, cultural directions are necessarily brief, but they cover the most important general points.

Contribution from the Bureau of Plant Industry

WM. A. TAYLOR, Chief

Washington, D. C.

Issued February, 1919
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GROWING FRUIT FOR HOME USE.

H. P. GOULD, *Pomologist*, and GEORGE M. DARROW, *Scientific Assistant, Office of Horticultural and Pomological Investigations.*

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WHY THE HOME FRUIT GARDEN.

A MORE general culture of fruits in gardens and in home orchards would contribute substantially to the health and pleasure of the average family, besides furnishing a supply of valuable food products at a relatively small outlay of money.

In many localities the difficulty incident to securing fruit in pleasing variety by purchase is an added reason for its home production wherever possible.

A sufficient range in variety of fruits can be produced throughout a large portion of the country to provide a supply in the fresh state for the table during a large part of the year and for canning or otherwise conserving for use when desired.

This bulletin deals with those widely grown fruits, such as the apple, peach, pear, and plum, which are commonly called deciduous. These fruits, with few exceptions, are borne on plants which shed their leaves annually and must be dormant for a period during each year in order to thrive. They become dormant in most cases through the influence of low temperatures.

THE POINT OF VIEW.

The commercial grower thinks and operates in terms of his orchard, carload shipments of fruit, and market prices. The one who grows fruit for home use thinks in terms of individual trees or

plants and works to secure a supply for family use. The commercial grower measures his success principally by the effect on his bank account; the one who grows fruit for home use, by the regularity and quality of the supply that comes to his table and the satisfaction derived from having it fresh and tree ripened and the product of his own efforts.

The ideal fruit garden or home orchard should contain several different kinds of fruit, represented in many cases by a considerable number of varieties ripening one after another over a long period. Large yields, good shipping quality, and attractiveness in appearance may be made secondary to high dessert quality or special excellence for cooking purposes.

THE PLAN.

The home fruit plat should be planned carefully and, in general, with a view to supplying fruit continuously throughout the year either in the fresh state or canned or otherwise conserved. Through-

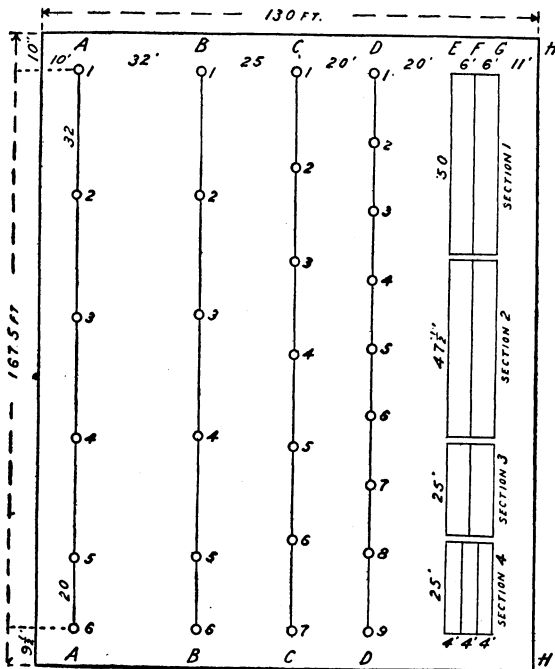


FIG. 1.—Suggested arrangement for a half-acre fruit garden. (See text for details.)

out a large part of the country one may grow in the same garden, if he so desires, the following fruits: Apples, pears, peaches, plums, cherries, quinces, strawberries, raspberries, blackberries, dewberries, currants, gooseberries, and grapes. In the colder sections the winters are too severe for peaches and also for some of the other fruits named unless they are protected; while in the warmer parts apples, currants, gooseberries, and certain varieties of several of the other fruits fail because

they are not adapted to the long hot summers and mild winters. But in these warmer regions, Japanese persimmons succeed, and in some of them figs and certain other fruits can be planted successfully. Therefore, one of the most important features of the plan for the

home fruit plantation is the selection of kinds of fruits and varieties of those kinds which will do well in the given locality and which will serve best the purpose for which they are desired.

The diagram shown in figure 1 may be helpful to the prospective amateur fruit grower in planning the arrangement of the ground he is to use for fruits. It represents a half acre of land divided with a view to planting at specified distances apart a given number of different kinds of trees and other fruit-bearing plants, including also a border wide enough to prevent the undue encroachment of the trees on adjacent land.

The fruits provided for in the diagram (fig. 1), by rows, are as follows:

Rows A and B: Nos. 1 to 5, apples; No. 6, apricots.

Row C: Nos. 1 to 3, pears; Nos. 4 and 5, sour cherries; Nos. 6 and 7, sweet cherries.

Row D: Nos. 1 to 5, peaches; Nos. 6 to 9, plums.

Rows E, F, and G: Section 1, raspberries (three varieties); section 2, blackberries (two varieties) and dewberries (one variety); section 3, currants (two varieties) and gooseberries (one variety); section 4, strawberries (four varieties).

Row H: Grapevines, to be trained on a wire trellis, which serves also as a fence.

Quince trees are not specially provided for in this plan; but since they require only a small amount of space and not more than one or two would be needed as a rule, they could be planted between the apple trees or otherwise placed. In the colder parts of the country quinces might well be substituted for the apricots suggested for No. 6 in rows A and B.

It is not assumed that this plan will fit the exact conditions in any particular case, but it shows the possibilities of obtaining a large variety of fruits from a small area of land.

Though not indicated in the diagram (fig. 1), it is possible to plant between apple trees when set 32 feet apart smaller growing trees, such as the peach or plum, placing one between each two trees in the row as well as planting a row in the center of the spaces between the tree rows. This is a temporary arrangement, however, since the apple trees will eventually need all the space. Before crowding begins the interplanted trees should be removed.

Currants and gooseberries commonly do better, especially in the southern limits of their range, if grown where there is partial shade. This sometimes can be provided by planting them between fruit trees. Raspberries and blackberries are sometimes planted between trees, but the practice is not advised unless the soil is naturally moist and fertile.

Vegetables may also be grown between the trees while the latter are small and do not shade the ground very much. Some of the

early-maturing vegetables may even be grown between rows of strawberries during their first season. A row or two of strawberries may be planted in the middle of the space between two rows of trees and continued for a time.

THE SITE.

The location of the land on which the fruits are planted, other things being equal, should be convenient to the house. It should be well drained, since fruit trees can not thrive in poorly drained soil. The air drainage also must be good. Cold air settles to the lowest levels, and if a site is so located that cold air settles over it from some surrounding higher elevation, the fruit blossoms are likely to be killed by untimely spring frosts or the fruit may be injured by freezes in the autumn when sites located on the sides of slopes or at points which are higher than the surrounding area escape such injury.

Where the surface of the land is much broken and characterized by high hills, the farm buildings commonly occupy the higher points. In such instances the natural site for the fruit garden or home orchard is near the house, where both soil and air drainage usually are adequate. In other cases the buildings occupy low sites, which are likely to be frosty, and it would be better to plant the family orchard on higher land.

Most fruits can be grown on a great variety of soils, but where possible it is better to avoid light sandy soils and heavy clays. The latter are often difficult to manage in the intensive way necessary for the best success with fruit, while the very light soils are likely to be affected by the various extremes of heat, cold, and drought.

The character of the subsoil is perhaps of greater importance than that of the surface soil. In many instances fruit trees planted where the surface soil appeared to be suitable have failed because of hardpan or rock a few inches or perhaps even 2 or 3 feet below the surface, which prevented a deep penetration of the roots and also made a very shallow and insufficient moisture reservoir. A very coarse gravelly subsoil is little better so far as its effect on tree growth is concerned. A deep subsoil which is friable and porous enough to permit a ready penetration of the roots and a free movement of soil moisture is desirable.

OBTAINING NURSERY STOCK.

Good nursery stock of suitable kinds and varieties is fundamental to success in fruit growing. The average small planter is not in direct touch with nurserymen. He is more often visited by a traveling "fruit-tree agent," who may or may not represent a reputable

nursery, and who may or may not know the merits of different varieties and their adaptability to different conditions and regions. Instead of the planter, who should know what he wants and should place his order accordingly, the agent too often selects the kinds and varieties. Not infrequently a tree agent's visit brings the first suggestion that some fruit trees may be planted, and then the grower perhaps is induced to include in the order which he gives the agent some high-priced novelties whose value is uncertain and whose adaptability to the conditions where they are to be planted is entirely unknown.

While many of the long-established nurseries sell their stock largely through agents whose integrity is unquestioned, many other nurseries have no traveling agents, but sell direct to purchasers. It is better, as a rule, for a grower to deal directly with a nurseryman rather than through an agent.

In selecting varieties a prospective planter should avail himself of the suggestions of experienced fruit growers in his

community, the experiment station or the extension division of the college of agriculture in his own State, or the United States Department of Agriculture.

It is difficult to describe good nursery-stock. A good root system is essential. A tree or bush, as a rule, should have several main roots and many smaller ones when received from the nursery. A large mass of very small hairlike roots which radiate from a common point suggest a disease called hairy-root; wartlike growths on the larger roots or on the main stem just below the surface of the ground indi-

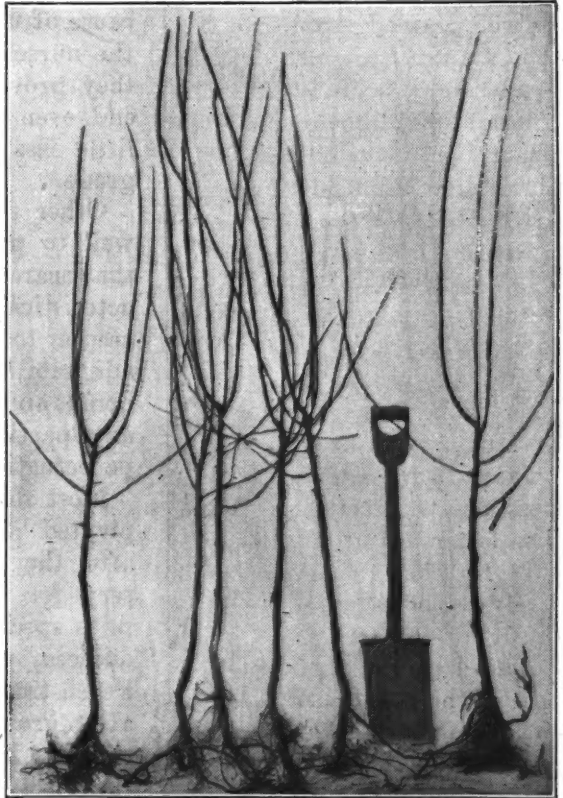


FIG. 2.—Well-grown 2-year-old Stayman Winesap apple trees as received from the nursery.

cate crown-gall. In either case the affected plant should be destroyed. Good grades of several different kinds of fruit trees as received from the nursery are shown in figures 2 to 6.

A plant or tree of medium size for the variety, if of suitable age, is usually preferable to a very large one. On the other hand, plants that are undersized are likely to have been stunted because of unfavorable conditions in the nursery, and not infrequently they prove very expensive in the end, even though the first cost is a little less than that of a better grade.

Other things being equal, it is well to purchase the stock from the nearest nursery. The characteristics of a variety with reference to hardiness, vigor, and adaptability to conditions are inherent and are not dependent upon any particular locality for their perpetuation.

Most deciduous fruit trees are planted as 2-year-olds; that is, after they have grown in the nursery for two seasons. This applies specifically to apples, pears, quinces, plums, and cherries. Peach trees are habitually planted after growing in the nursery one season. The practice among orchardists of planting apple and cherry trees when only 1 year old is becoming more common.

In setting out raspberries, blackberries, dewberries, and strawberries, young plants which grew the preceding season are generally

used except when they are handled in the autumn. In that case plants of the current season's growth are used.

DWARF TREES.

The practice of using dwarf instead of the ordinary standard trees is more or less prevalent among prospective planters of small areas.

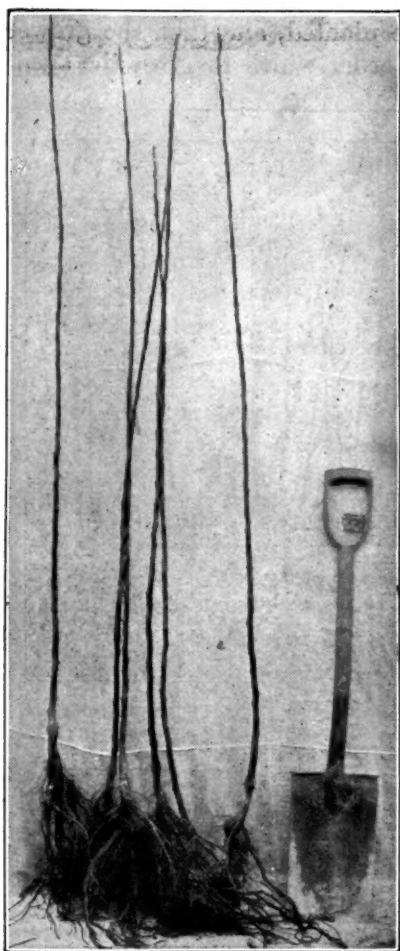


FIG. 3.—Well-grown 1-year-old Stayman Winesap apple trees as received from the nursery. Branching occurs in the second year's growth, as shown by figure 2.

Dwarf trees are produced by propagating them on certain stocks or roots which because of their inherently restricted habit of growth restrict also the size of the tops that have been grafted or budded on them.

While earliness of bearing and exceptionally high quality of the product are often claimed for dwarf trees, some of the best experience in this country has failed to substantiate the latter claim. Dwarf apple and pear trees have their place, however, in the garden or yard, especially under intensive methods of culture, where the space is too small to admit readily of the development of standard trees.

SEASON OF PLANTING.

In the North and wherever the winter conditions are severe on plant life, either from low temperatures, drying winds, or other causes, fruits are usually planted in the spring as early as the soil can be put in suitable condition.

It is very important that they be set out while the plants are perfectly dormant and before the buds have started. Many failures result from delaying the planting until the buds have started into growth.

In middle latitudes and in the South, where winter conditions are favorable, planting in the autumn, after well-matured nursery stock can be obtained, is widely practiced and is usually preferable to spring planting. In some parts of the South planting may be done at almost any time during the winter.

PREPARATION OF THE SOIL.

If the prospective planter prepares the soil where his fruits are to stand as thoroughly as he should prepare his garden before planting vegetable seeds, the subsequent growth of his fruit trees will amply repay him. Where the site selected is in sod, it is advisable to cultivate it during one season at least after the sod is plowed under, in order that the grass roots may decay before the fruits are planted. White grubs, which often infest sod land, are not so likely



FIG. 4.—Nursery stock, showing different grades or sizes of 1-year-old peach trees: A, 3 to 4 foot grade; B, 4 to 5 foot grade; C, 5 to 7 foot grade.

to be troublesome after the land has been cultivated for one season, especially if used for beans, peas, or some other crop not much attacked by this insect. Freeing the soil from white grubs is particularly important where strawberries are to be planted.

Sometimes the places selected for trees are in a yard which the owner desires to retain as a lawn. In this case the best course is to spade up the soil deeply over an area of several square feet where each tree is to stand. This plan, however, is a compromise between a lawn and a fruit garden, and the results are likely to be more

or less unsatisfactory from either standpoint unless special pains are taken to maintain both soil fertility and moisture. The peach is less desirable as a lawn tree than the apple, the cherry, or the pear.

HANDLING THE STOCK FROM THE NURSERY.

Many of the trees and berry plants set out in the home orchard and garden fail to grow because they are not properly handled.

Every possible precaution should be taken from the time



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Fig. 5.—Sour-cherry trees representing different grades of nursery stock, as follows: A, 2-year-old Large Montmorency on mazzard stocks, three-fourths inch grade, 5 to 7 feet; B, same as A except that the trees are on mahaleb stocks; C, 1-year-old Montmorency on mazzard stocks, five-eighths to eleven-sixteenths inch grade, 3 to 4 feet; D, 1-year-old Large Montmorency on mahaleb stocks.

the trees and other plants are dug from the nursery until they are planted to prevent the roots from becoming dry. If the plants are to be set out at once on being received, almost any temporary means of protecting the roots so that they will not become dry will suffice. Wet gunny sacks, an old horse blanket, or some other material that has been thoroughly moistened will serve the purpose. If it is necessary to delay planting for any considerable time, the trees should be heeled in. This operation is illustrated in figure 7. A trench is opened of sufficient size to receive the roots. If the trees are tied in bundles, they should be loosened and the roots separated when they are placed in the trench so that the soil can be worked in among them readily,

packed rather firmly, thus excluding the air, and, finally, enough soil should be heaped over the roots to prevent drying out. In this way the stock can be held in good condition for any reasonable length of time, but the planting should be done before the buds start into growth.

PLANTING.

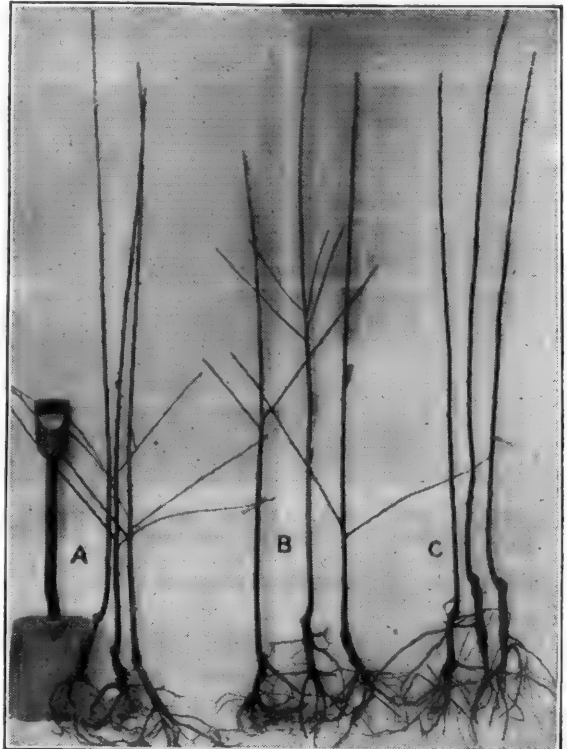
Before the planting operation actually begins, the exact spots to be occupied by the individual trees or the rows where the small-fruit plants are to stand should be designated. The distances between most of the various kinds of fruit trees are shown in figure 1.

Apricots may be planted the same distance apart as peach trees; Japanese persimmons and figs also are planted about the same distance apart, or a little nearer together, though in California the larger growing varieties of figs should be spaced about the same as apples. Quinces, being smaller, may be planted about 14 to 16 feet apart.

The distance between the rows of bush fruits is also shown in figure 1. The spacing of the plants in the rows

should be, in general, about as follows: Blackberries and raspberries, 3 feet; dewberries, currants, and gooseberries, 4 feet. Strawberries should be set in rows 3 to 4 feet apart, and the plants 12 to 24 inches in the row. Grapes should be 8 to 10 feet apart each way.

If trees are to be planted in a yard or along a fence where it is impracticable to plow and cultivate the land, due care should be exercised in placing them properly. The relation which the trees



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FIG. 6.—Sweet-cherry nursery stock: A, 1-year-old Windsor trees on mahaleb stocks, five-eighths to eleven-sixteenths inch grade (the branching is characteristic of this variety); B, same as A except that the trees are on mazzard stocks; C, 1-year-old Schmidt trees on mahaleb stocks, five-eighths to eleven-sixteenths inch grade.

will have to adjacent buildings or to the landscape when they attain considerable size should be carefully studied in order to avoid irreparable mistakes in relating the trees to their surroundings.

Locate the first row at the desired distance from the base. This may be half the distance between rows or closer, according to circumstances. (Fig. 1.) Drive stakes where the trees are to stand, and line off the next rows in the same manner till the whole plat is

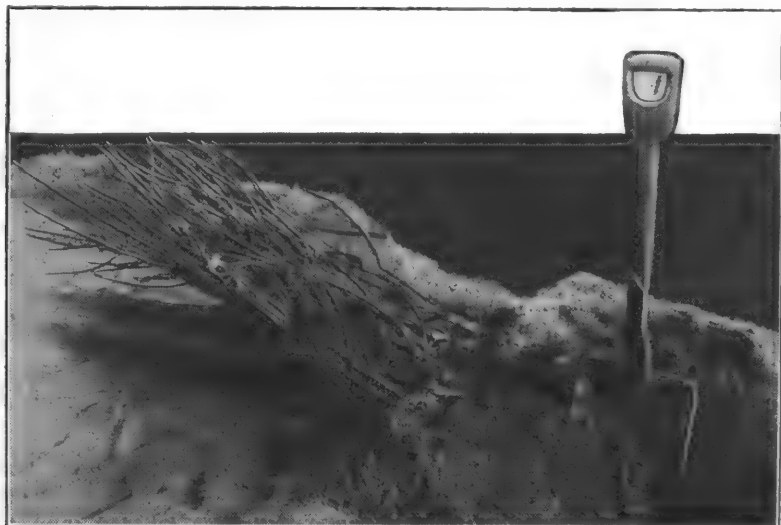


FIG. 7.—Peach trees heeled in. They may be held in good condition in this manner for some time, but should be planted as soon as possible.

staked out. In planting the trees, use a planting board, as shown in figure 8.

The trees should stand an inch or two deeper when planted than they stood in the nursery, and the holes should be broad enough to receive the roots without bending them from their natural positions. This applies also to raspberry, blackberry, currant, and other small-fruit plants with the exception of strawberries. The last should be planted at such a depth that the crown of the plant is even with the surface. If they are planted deeper than this they are likely to smother, while if planted more shallow the roots are likely to dry out.

Under some conditions in planting small fruits it is convenient to open a furrow with a plow along the lines which mark the location of the rows. By doing this the work required in making the holes for individual plants is considerably lessened, although in the home fruit plantation it usually will be more convenient to dig a hole for each plant.

The broken ends of roots should be cut off and any long slender roots should be shortened to correspond to the main root system.

Small-fruit plants should be treated in about the same way, though in actual practice little attention is given to trimming the roots before the plants are set out.

In filling the holes after the trees are placed in position care should be taken to work finely pulverized fertile soil among the roots. This can be done with the fingers better than in almost any other way. After a few shovelfuls of soil have been placed about the roots, it helps if the tree is slightly raised and lowered once or twice. This will tend to work the fine soil in among the roots. As the filling progresses the soil should be firmed about the roots with the foot or in some other effective way. Of all the operations connected with planting, the firming of the soil about the roots is perhaps the most important, and it should be done with great thoroughness. Finally, the holes should be filled even with the surface.

In connection with the planting or immediately following it, the branches of fruit trees should be cut back with a view to giving a desirable form to the top as it develops subsequently. The details of shaping the tops of different kinds of trees at the time they are planted are shown in figures 9 to 12.

Sometimes when trees are planted in autumn, the branches are cut back to some extent at that time, but the final pruning is deferred until the following spring.

In planting raspberries, blackberries, currants, and gooseberries, the tops should be cut back to a height of about 6 inches. If currants and gooseberries have particularly strong root systems, the tops are sometimes left 10 to 12 inches high.

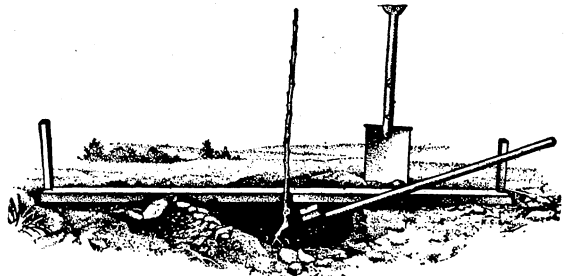


FIG. 8.—Using a planting board in setting a tree. The board has been put in place with the center stake where the tree is shown. It has been taken up and the hole dug; then the board has been returned to its former position, as indicated by the end stakes (which have not been moved). The tree is in the position of the center stake. The tool at the right of the tree is for tamping the soil about the roots.

CULTURAL METHODS.

Where the fruit plantation occupies a garden site, usually it should receive about the same tillage that is given a vegetable plat. In the popular mind this represents a high standard of excellence. Frequent tillage to maintain the surface soil in the condition of a fine dust mulch is preferable in most cases to any other method of treat-

ment. The tillage of fruit trees should be continued until mid-summer in the North, but it may be kept up to good advantage somewhat later in the South. Strawberries, as a rule, should be cultivated until the approach of cold weather.

Under some conditions the owner may prefer to have his trees in sod. Where the soil is well supplied with humus and the moisture conditions are favorable, this practice may not be impracticable; in fact, a "sod mulch" sometimes gives very excellent results. However, it is usually advisable to cut the grass several times during the season and permit it to remain on the surface of the ground as a mulch; this serves in part the same purpose as a dust mulch which is maintained by cultivation. This should be the usual practice when trees are planted in a yard or along the borders of a lawn. In addition, the soil should be kept well spaded about the trees within a radius of 2 or 3 feet of the trunks. This is especially important during the first few years after planting.



FIG. 9.—A 2-year-old apple tree pruned when planted with a view to developing an open-center top. This tree is one of those shown in figure 2.

Under ordinary conditions small fruits should be given about the same tillage that a well-cared-for vegetable garden receives, except that strawberries are not cultivated much in the spring until after the crop is harvested.

MAINTAINING SOIL FERTILITY.

Under most conditions the same methods of maintaining the fertility of the soil which are followed in a vegetable garden are successful with fruits. Where stable manure is available, its liberal use generally gives excellent results.

A considerable part of the value of stable manure is in the humus which it adds to the soil. If manure is not available, however, it may be beneficial to work into the soil leaves, cornstalks, straw, lawn clippings, or other refuse vegetable matter which will decay readily. Under some conditions rye or some other crop may be sown in the autumn, or after the season's cultivation is ended, and plowed under the following spring. Other cover crops may also be used as conditions permit.

No specific directions can be given for the use of commercial fertilizers, since the condition of the soil and the amount of plant food available in it vary widely and the needs of the soil for the best results can be determined only by experiment. The application of a complete fertilizer or such other forms of commercial plant food as experience may have proved to be successful generally in the growing of other crops on soil similar to that occupied by the fruit plantation is best in the fruit garden or home orchard.

PRUNING AND TRAINING.

While different details need to be considered in pruning different kinds of trees, the general principles are the same for all tree fruits.

Pruning at the time the trees are planted is illustrated in figures 9 to 12. During the dormant period following the first season's growth, three to five branches should be selected to make the framework of the permanent top, if this was not done when the trees were planted. These branches are sometimes called the "scaffold" branches. They should be selected as far as possible with a view to their symmetrical arrangement

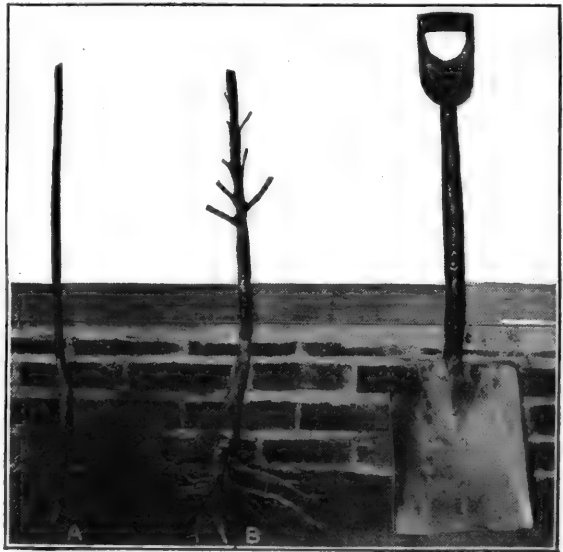


FIG. 10.—Peach trees trimmed ready to plant: A, 4 to 5 foot grade; B, 5 to 7 foot grade.

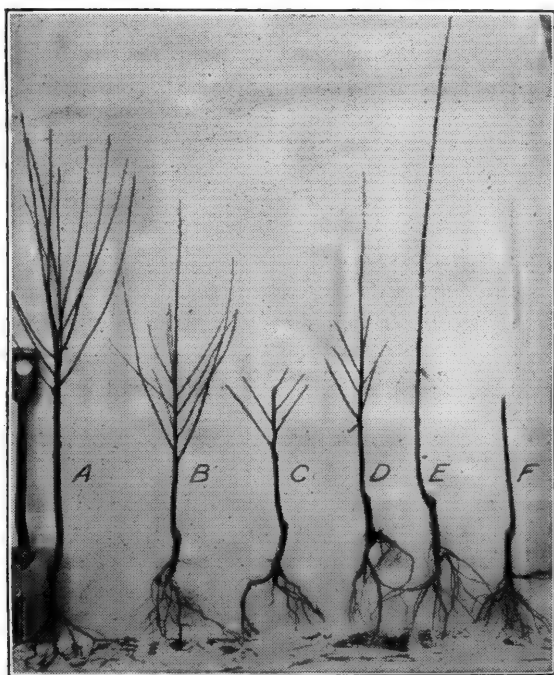
and their relative positions up and down the trunk of the tree. When possible so to select them, there should be a space of at least 2 or 3 inches vertically between adjacent branches. If two of the main branches start from the trunk at the same level, they will be more likely to split down later in the life of the tree when it bears heavy loads of fruit than if they start from the trunk at different heights.

In order to make the main limbs strong and stocky and to control, in a measure, the branching of the tree in the second season's growth, from one-third to one-half, or sometimes even a larger portion, of the growth made during the first season is usually cut off in the subsequent dormant pruning. Some thinning out of the branches may also be necessary.

The pruning after the second season's growth is not unlike that of the first season. It should be done with a view to making the top symmetrical and to keep it open for the free access of sunshine and air. In order to accomplish this, some cutting out of superfluous branches will usually be necessary, as in the previous year. Again, in most cases more or less heading back of the previous season's growth should be done. In the opinion of some commercial fruit growers of wide experience, it is best to remove all

except two of the side branches which have developed from the scaffold limbs during the second season's growth. Thus, after the second season's pruning is done there will remain only twice as many limbs from which growth will be renewed the following season as was the case when the pruning after the first season's growth was completed.

With most fruit trees, pruning in after years should consist in keeping the tops free from superfluous growth, thus making them sufficiently open to permit every fruit bud and developing fruit to receive a maximum of sunlight.



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FIG. 11.—Cherry trees showing the methods of shaping the tops at the time of planting: A, a 2-year-old Large Montmorency unpruned; B, a 1-year-old Large Montmorency, unpruned; C, same as B, pruned to be grown with an open center; D, a 1-year-old Large Montmorency, pruned to be grown with a central leader; E, a 1-year-old Schmidt unpruned; F, same as E, headed back ready for planting.

The accompanying illustrations bring out more clearly the points mentioned above. Figure 13 shows an apple tree in August of the first season after planting. It was pruned when planted in much the same manner as the tree shown in figure 9, though the limbs, five in number, which were selected to form the framework of the top were rather more uniform in size.

As the tree in figure 13 began growth, two or more buds on each limb developed secondary branches in a manner nearly ideal for an

open-center type of pruning. The growth made up to August is indicated by the branches which bear foliage. Probably they increased somewhat in length before the close of the growing season. The pruning to be done during the following dormant season will consist in cutting back the growth made the preceding season about one-half or more, depending on its length, and in removing entire branches if there are too many.

The forming of the top of an apple tree is further illustrated in figures 14 to 16, with their accompanying legends. These figures show the same tree in different stages of growth. The tree as it appeared in July, 1915, is seen in figure 16. Considerably more growth was made before the end of that season. The branches were not cut back after that season's growth. When growth was renewed in the spring of 1916, only buds near the ends of the 1915 growth developed branches, thus leaving unduly long unbranched limbs represented by nearly the entire growth made in 1915 (fig. 17). Had these limbs been cut back during the dormant season following the growth of 1915 to correspond with the condition shown in figure 15, the buds near the ends of the branches left in the cutting back would have developed secondary branches, as shown in figure 16 following the cutting back shown in figure 15, and the framework would have been kept better proportioned. The pruning done to correct the fault shown in figure 16 is indicated in figure 18. It is possible that the tree would have borne fruit earlier if the pruning had been less severe.

If the plan here suggested of cutting back and thinning out the new growth each year is followed for the first three or four years or until the frame of the top is well established, it may be well thereafter to do comparatively little pruning for the next few years or until the tree comes into bearing. However, the character and vigor of the growth will need to be considered each year and treated accordingly.



FIG. 12.—A sweet-cherry tree of the Schmidt variety planted as a 2-year-old in the spring of 1915 and shaped with a view to its being pruned as an open-center tree. (Michigan, July 8, 1915.)

The ultimate results to aim for in a mature tree are suggested in figure 19. While this tree was not pruned entirely in accordance with the details outlined above, the results shown in the open well-balanced top that has been secured are fairly good.

Pear trees are pruned much like apple trees.

The essential features of pruning peach trees are shown in figure 20. The tree shown was cut to a straight unbranched stem when planted,



FIG. 13.—An apple tree in August of its first season's growth in the orchard. It was a 2-year-old tree when planted.



PI5982HP

FIG. 14.—A Delicious apple tree after two seasons' growth as it appeared before its annual pruning. The foundation for the top consists of four or five main limbs. Compare this with figures 15 and 16.

and the four limbs which make the top developed before July 21 of the season when the photograph was taken. The tree doubtless made considerably more growth before the end of the season.

During the following dormant season the main limbs should be cut back and the side branches thinned out as may seem necessary to prevent the top from becoming too dense during the second season's growth. In general, this course should be followed each year, though the details will vary with the amount and strength of the annual growth which the tree makes. Figure 21 shows a peach tree 6 years old which has been pruned about as described.

Figure 22 shows a sour-cherry tree which has also been pruned to an open head, though comparatively little cutting back of the annual growth made by the main limbs has been practiced.

Plum trees are pruned about the same as cherry trees.

Quince trees make a rather slow growth, and the fruit is borne on the ends of the current season's growth. As soon as a fruit bud forms on the end of a twig the latter ceases to increase in length for the season. For this reason a quince tree does not increase in size as rapidly as most other fruit trees. Pruning quince trees therefore consists largely in removing dead branches, limbs that cross one another, and any superfluous growth that may develop.

The usual time for pruning fruit trees for the purpose of keeping them shapely and for removing superfluous wood is during the dormant season, preferably during the latter part of winter or early spring.

The manner in which the wounds are made when branches are removed has much to do with the rapidity and completeness of their healing. In removing a branch the surface of the wound should be as nearly as possible parallel with and close to the limb from which it is removed.

The results of leaving stubs are shown in figure 23. In this figure a stub, the end of which is dead, is shown at *A*. It will never heal over. In time it will decay. The normal course will be for the decay to extend into the trunk of the tree. A wound that is healing fairly well is shown at *B*, but a stub was left in cutting off the branch. It would have been better had the cut been made along the line *b-b*, even though the resulting wound would have been a little larger than the one that was made.

If the wounds from pruning are so large that they can not heal over in one or two seasons, some kind of protective coating is sometimes applied. A good grade of white lead thinned with linseed oil is recommended for this purpose.



P15983HP

FIG. 15.—The tree shown in figure 14 after being pruned. Both figures were reproduced from photographs taken at Akron, Colo., November 12, 1914.

The pruning of raspberries, blackberries, and dewberries should consist of the removal of the fruiting canes after the season's crop is harvested and the thinning out of the suckers and canes which have developed.

Ordinarily the new growth of red raspberries should be allowed to develop without heading back. Varieties having short upright canes should be trained in hedge rows. Those having taller growing canes should be trained to a wire trellis, or to a stake set by each plant. Black and purple raspberries should be trained as are the red varieties



FIG. 16.—The same tree shown in figures 14 and 15 as it appeared in July of the following season. The buds near the ends of the stubs in figure 15 have developed into branches, thus making a good framework for a strong well-branched tree. (Akron, Colo., July 21, 1915.)

which have tall canes; or the new growth may be headed back when it reaches a height of 18 to 24 inches. This new growth will then send out side branches, and the following spring these should be cut back somewhat.

The new growth of blackberries is sometimes headed back when it reaches a height of 2 to 3 feet, and the side branches are cut back the following spring, much as are those of black and purple raspberries; or the new growth may be allowed to develop without any heading until the following spring, when the canes are tied to stakes, as is sometimes done with red raspberries.

The new growth of dewberries should be left on the ground until spring, when it may be trained to a stake or to a low wire trellis made by stringing a wire along a line of stakes 1 to 2 feet high. When trained to stakes the canes should be cut off at the top of the stakes at the time they are tied up.

Currants and gooseberries should be thinned out as may be necessary to maintain six or eight vigorous shoots in each plant. Most of the fruit is borne on spurs on 2 and 3 year old wood. By removing all wood which has passed its most productive period and permitting

new canes to develop in place of those cut out, it is possible to maintain the bushes with a maximum amount of the most productive wood.¹

In pruning grapevines it should be noted that (1) the fruit is borne on shoots that grow in the spring from canes of the previous season's growth; (2) the best fruit is produced on vines where the shoots develop from points near the trunk; (3) the number of clusters of grapes borne by each vine can be controlled by the number of strong buds left at the annual pruning. If the vine is very strong 15 to 25 buds may be left. These should produce 30 to 50 clusters of grapes. Fewer buds should be left on a weak vine.

Thus, the pruning of a grapevine consists fundamentally of removing in each dormant season the canes that have borne a crop of fruit the preceding summer, leaving only a sufficient number of buds to provide for the growth of fruit-bearing canes for the following season. The details of pruning, though simple, vary

considerably, depending on the system of training used, of which there are several. No one system is the best for all varieties and for all conditions. One of the simplest is the four-arm renewal system shown in figures 24 and 25. This system requires a two-wire trellis, as suggested by the figures. The lower wire is placed about 30 inches from the ground; the upper one, about 20 to 24 inches above the lower. No. 10 or 12 wire may be used. By the end of the second year the lower wire of the trellis should be provided. The upper wire will not be required until a year later.



FIG. 17.—The tree shown in figure 16 as it appeared the last of August, 1916, no pruning having been done since November, 1914, when it appeared as shown in figure 15. The growth (about 3 feet in length) between the arrows *a* and *b* is unbranched and is typical of all the limbs. This tends to raise the top unduly.

¹ Further details of the pruning and culture of small fruits occur in the following Farmers' Bulletins: Nos. 643, Blackberry Culture; 728, Dewberry Culture; 887, Raspberry Culture; 1024, Currants and Gooseberries.

The manner of renewing the growth on the body of the vine so as to leave the body permanent is illustrated in figures 24 and 25, which show the same vine before and after pruning.

In figure 24 the 2-year-old arms 1, 2, 3, and 4, which grew during the previous summer, were the only ones allowed to remain of all the canes when the vine was pruned in the winter. The canes shown

grew from these and bore fruit the next summer. When pruned the following winter, as seen in figure 25, only the canes *a*, *b*, *c*, and *d* were left, and these were tied to the wire in the same manner as the arms 1, 2, 3, and 4 of the season before. (Fig. 24.) The spurs shown (fig. 25 *Sp.*) are canes cut back to one to four eyes for the purpose of starting new canes to be left the following year. It took 10 cuts to prune the entire vine.

Grapes may be pruned at any time when the canes are not frozen, from the time the leaves drop in the autumn until the buds swell in the spring. Pruning after the sap begins to flow is considered injurious.¹



FIG. 18.—The tree shown in figure 17 after being pruned to correct the faults arising because it was not pruned after the seasonal growth of 1915. The severe pruning here indicated may have delayed fruiting somewhat, but the formation of a good top at this period of the tree's development seemed more important than early productiveness.

CONTROL OF INSECT PESTS AND FUNGUS DISEASES.

The same kinds of insect pests and fungus diseases that are found in a commercial orchard in any region may be expected to occur in a fruit garden or home orchard located in the same region. Therefore, in planning a home fruit plantation the grower should inform

¹ For further details concerning grape pruning, see Farmers' Bulletins 471, Grape Propagation, Pruning and Training, and 709, Muscadine Grapes.

himself as completely as is possible in regard to the methods of controlling the common insects and diseases to which the fruits he is growing are subject in his locality. This information may be found in bulletins issued by State experiment stations, agricultural college extension divisions, the United States Department of Agriculture, and elsewhere.

The present reference to the control of insect pests and fungous diseases is intended primarily to emphasize the importance of exercising great vigilance in this direction. Too often the home fruit plantation in the neighborhood of commercial orchards may become virtually a public nuisance as a breeding place and source of dissemination



FIG. 19.—A desirable form for a mature apple tree, such as may be developed by judicious pruning. This tree is about 30 years old.

of serious insect pests and fungous diseases. In some States the law recognizes such places as a menace to public welfare and authorizes entry by duly appointed officials and the destruction of the infested trees or plants. Therefore, when a home fruit grower establishes his plantation he assumes certain obligations of a more or less public nature to maintain it in such a way that it will not interfere in any manner with the interests of others. If this is not the viewpoint and the spirit in which a home fruit plantation is planned, it would better not be established.

IRRIGATION.

In semiarid regions irrigation is practically essential to the successful growing of many fruits, especially small fruits; and, in fact, in regions of limited rainfall it greatly increases the chances of suc-

cess with all fruits. Even in humid sections fruit growers who have installed an irrigating system without undue cost often find that it pays well, since it gives them a means of averting losses which otherwise would be suffered in times of severe drought. This is true especially of strawberry and other small-fruit growers, though in some cases orchardists in humid sections have provided irrigation facilities for their orchards.

Two systems of applying irrigation water are in more or less common use. In one—the overhead-spray system—the water is distributed through pipes supported on posts placed at intervals through the area to be irrigated, as illustrated in figure 26. The pipes are so perforated that when the water, which must be under some pressure,

is turned into them, it is distributed over the entire surface that is to be covered. This system is used principally in irrigating strawberries and other low-growing plants.

In the other system, the water is distributed through furrows usually 3 to 4 feet apart between the rows. This system requires a uniform surface that slopes gently from the source of the water supply; or if the surface is so broken or hilly that it can not be leveled it will be necessary to make the furrows nearly parallel with the slopes. A young orchard furrowed for irrigation is shown in figure 27.

Still another method, the basin system, is sometimes used and may be adapted to the home



FIG. 20.—A peach tree in July of its first season's growth in the orchard. When planted it was pruned to a straight unbranched stem about 18 inches high.

orchard in place of the other systems. This consists essentially in making a large basin about each tree either by excavating the soil somewhat or by mounding up a ridge of soil around the tree at some distance from it. The water is conveyed into the basin thus made through a pipe or in some other way.

While the overhead and furrow systems are used primarily in commercial activities, they can be adapted readily to the home orchard or fruit garden.

Further information in regard to irrigation may be obtained in other bulletins issued by the United States Department of Agriculture.

VARIETIES OF FRUIT FOR DIFFERENT REGIONS.

In order that the amateur grower who has little knowledge of fruit varieties may be guided in his selections the country has been divided into 14 main districts, as shown by figure 28, and lists of varieties of the different kinds which are considered desirable for each district are given in later pages.

The lists are intended to be suggestive primarily, although the aim is to make them as useful as possible and to include only varieties which possess a high degree of merit for home use in the different districts.



FIG. 21.—A well-formed 6-year-old peach tree which has had systematic pruning.

Information in regard to varieties may be obtained from standard works on pomology; from bulletins of the State experiment stations, agricultural colleges and their extension divisions, and the United States Department of Agriculture; by correspondence with these public agencies; and from experienced fruit growers.

DESCRIPTION OF THE DIFFERENT FRUIT DISTRICTS.

While other factors aside from climate must be considered in selecting fruit varieties for growing in different regions, the temperature represents the most important limiting factor in the distribution of fruits and their varieties.

The lines on the map, which seem to indicate sharp and definite boundaries for the various districts, are arbitrary and really only approximate. As a matter of fact there is a constant gradation from one district to another. The only marked exceptions are local, as where a few hundred feet up or down a mountain slope brings one through very definite pomological zones in which there are well-defined differences in the behavior of the same variety or where large bodies of water modify the climatic conditions in a narrow belt along their shores, so that many fruits can be grown which do not succeed farther inland. Sharply defined soil differences of some kinds might also be included in this connection.

The following descriptions of the different districts will help the reader in making use of the lists of varieties which are given later.

District 1 includes the colder portions of New England, New York, and Michigan. Because of the low winter temperatures only varieties which are very hardy should be planted. In the more extreme portions some of the varieties suggested for this district may not be entirely hardy.

District 2 includes what is commonly termed the "northern fruit belt." To provide for certain differ-



FIG. 22.—A Montmorency cherry tree in its third season's growth from planting, pruned to an open center. (Michigan, July 9, 1915.)

ences in the adaptability of small fruits this district is subdivided into eastern and western sections.

District 3 includes certain regions of important commercial production of different fruits. Since it embraces practically all of the Appalachian Mountain system, with altitudes ranging from the highest east of the Rocky Mountains to practically sea level, the climatic conditions are extremely variable. Excluding the highest altitudes at which fruit is grown in this district, the varieties to be recommended for different sections are similar, with the exception of certain small fruits, to provide for which the district is divided into eastern and western sections. Since there is a correlation between

altitude and latitude, it follows that many of the varieties, especially of the tree fruits named for district 2, can be grown with success at the higher altitudes in district 3.

District 4 is definitely southern in its climate, and many of the fruits which are grown in the more northern districts are not recommended, while certain fruits which can not be grown farther north appear in the lists. District 4 is subdivided into eastern and western sections.

District 5, together with the Coastal Plain region of district 4, includes practically all the Muscadine grape and subtropical fruit-growing regions of the country outside of California and southern Arizona.

District 6 includes the Ozark region and other important fruit districts of the central Mississippi, lower Missouri, and Arkansas River Valleys. Many of the varieties suggested are the same as those named for district 3.

District 7 differs considerably from district 6 in various climatic factors. The winter temperatures are more severe in the more northern district, and many of the varieties named for district 6 are replaced in district 7 by hardier sorts.

District 8 is characterized by low winter temperatures and drying winds. A large part of it, especially west of eastern South Dakota and eastern Nebraska, has very limited rainfall. It is a district in which the planting of only very hardy varieties can be advised.

District 9 has many of the characteristics of district 8, but in an intensified form. Comparatively few varieties possess sufficient hardiness with regard to low temperatures, drying winds, and drought resistance to be grown successfully in this district.

District 10 is a portion of the Great Plains area which is characterized by a comparatively high altitude, very limited rainfall, and more or less constant wind. Because of these elements the conditions are rather difficult for fruit growing.



FIG. 23.—Wounds in pruning improperly made. At A is a long stub which will never heal over. The wound at B is healing fairly well, but better results would have followed had the limb been cut off in the line of b—b.

District 11 is not as clearly defined in its characteristics as most of the others. Because of its southern location, even though with fairly high altitudes, the winter temperatures are mild. There are several irrigated districts in the Rio Grande and Pecos Valleys in New Mexico, and there is an irrigated region in the El Paso section in Texas in which fruits somewhat characteristic of a mild climate are being grown.

District 12 is exceedingly variable, since it includes the Inter-mountain States, which are characterized by the high altitudes of the Rocky Mountains and by valleys provided with irrigation facilities,

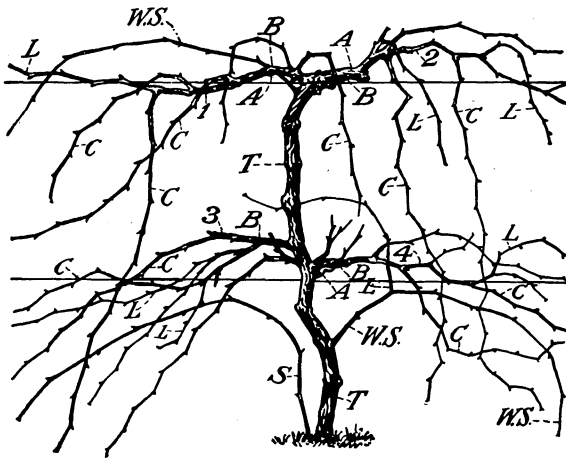


FIG. 24.—Diagram of a grapevine before pruning, showing the different parts and illustrating the four-arm system of training: A, Arms or ramifications of the branches, usually of wood two or more years old; B, branches which are of mature wood, being several years old; C, canes, called shoots when green and canes when mature; L, laterals, the secondary shoots of a cane; S, suckers, the shoots starting below the ground from the main body; T, trunk, the stem or main body of the vine; W. S., watersprouts, the shoots which start above the ground from wood older than one year; 1, 2, 3, 4, 2-year-old arms.

where intensive types of agriculture, including fruit growing, are carried on. From the standpoint of fruit growing, this district is made up substantially of at least three zones or regions. The conditions are adverse to fruit growing, practically to the point of being prohibitive, at altitudes exceeding about 7,000 to 8,000 feet. A second zone is represented by the irrigated valleys, in which a wide range

of fruits and other crops can be grown. The third zone is represented by the areas where crop production of all kinds is restricted or attended with considerable difficulty on account of very limited rainfall and where irrigation can not be or has not been provided.

While conditions vary from north to south, the varieties which can be suggested for growing throughout this district, especially in the more favorable zone, are very similar. In the dry-land areas, where the conditions are adverse and where the altitudes are relatively high, many of the varieties named for district 8 will probably be

more successful than a considerable proportion of those named for district 12.

In southern Utah and the northern portion of Arizona the climatic conditions, except at the higher altitudes, tend to preclude the growing of such fruits as the apple, currant, and gooseberry.

District 13 contains several important commercial fruit-producing areas, as the Puget Sound region in Washington, the Willamette and Rogue River Valleys in Oregon, and other areas. The mixture of varieties of northern and middle latitudes in the fruits grown in this district is rather noticeable.

District 14 admits of almost endless subdivisions, since within the district there are regions in which the climate is distinctly subtropical; also those in which there is perpetual snow. Within the fruit-growing sections of California the conditions naturally admit of division into coastal, interior valley, and foothill regions.

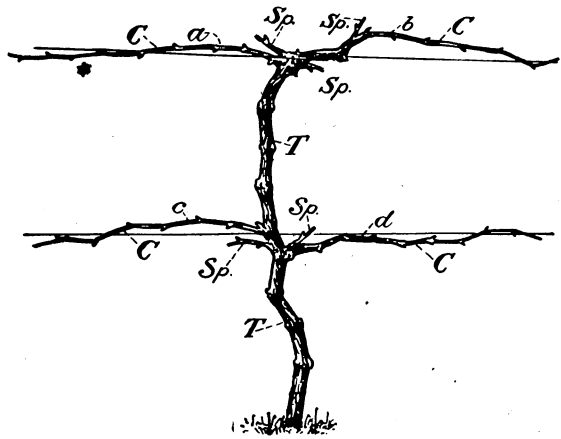


FIG. 25.—A vine pruned according to the four-arm system: *C*, Canes, called shoots when green and canes when mature; *Sp.*, spurs, canes cut back to one to four eyes; *T*, trunk, the stem or main body of the vine; *a*, *b*, *c*, *d*, arms succeeding those shown at their 2-year-old stage in figure 24 at 1, 2, 3, 4.

COMMENTS ON FRUIT VARIETIES.

APPLE VARIETIES.

The lists which follow are made up of varieties which are of value for home use in the different districts. As nearly as it is practicable to do so, the

varieties are named in their approximate order of ripening, and they are grouped into early, midseason, and winter sorts. These terms are relative only, the season of use of the different varieties in many instances overlapping. This is true especially of the midseason and winter sorts. A considerable proportion of those which are grouped as midseason varieties may extend their ripening period into early winter, while the season of some of the varieties grouped as winter will begin in the late autumn. This grouping of the varieties is intended especially to help the grower whose plantings must be limited to a very few trees.

No crab apples are given in any of the lists. The Transcendent as an early variety and the Hyslop for a later sort so largely predominate among the crabs in most of the districts that it seems unnecessary to name others, except possibly the Florence, which is grown to some extent in the upper Mississippi Valley.

PEAR VARIETIES.

While the ideal home orchard or fruit garden is hardly complete without pears, the prevalence of pear-blight and its destructiveness render growing rather uncertain. The lists are made up in most cases of only a very few of the choicer sorts.

Pear varieties are so generally sterile with regard to their own pollen that it is always advisable in planting them to choose at least two sorts.

The Kieffer, as will be noted, appears in most of the lists. This variety blossoms somewhat earlier than most other pears; hence, to



FIG. 26.—A strawberry field provided with an overhead-spray system of irrigation. The water is distributed through perforated pipes supported on posts. (Photographed at Bridgeton, N. J.)

insure the most nearly perfect cross-pollination it is usually advisable to plant a tree of either the Garber or Le Conte with the Kieffer, as these three varieties blossom at approximately the same time.

PEACH VARIETIES.

The varieties listed represent the choicer sorts for their seasons and are named, so far as possible, in the order in which they ripen. As a rule, the very early varieties are poor in dessert quality, and where only a very small number of trees can be planted, the grower will do well to choose some of the midseason or later varieties of better quality. In many instances, also, the very late varieties will be less desirable for home planting than the midseason sorts.

The characteristics which are usually of the most concern to the grower are the color of the flesh and the adhesion of the flesh to the stone. To supply this information in brief, certain letters appear

in parentheses after each variety, as follows: c = clingstone, f = freestone, fc = sometimes freestone and sometimes clingstone (or in some cases the flesh separates from the stone with little difficulty, yet not with perfect freedom), r = red flesh, w = white flesh, y = yellow flesh.

PLUM VARIETIES.

The plum varieties in the various lists are named without reference to any particular order of ripening. "Damsons," much used for making marmalades, preserves, and in other ways, belong to the European group of plums and are listed under plums for the districts in which their planting is suggested.

The Japanese varieties and most native ones are usually sterile with regard to their own pollen. It is, therefore, always advisable in planting even two trees to select one each of two varieties which blossom at the same time. A single tree isolated from other plums is likely to prove unproductive even though it may blossom freely.

CHERRY VARIETIES.

The number of varieties of cherries to be recommended for planting is small. In some of the lists the varieties named are grouped

under "Sour" and "Sweet." When no sweet varieties are named, it is to be understood that the planting of them is not advised in the districts to which the lists apply. Where only a single sour variety is desired, the Montmorency should usually be given the preference. The naming of other sour varieties is only for the purpose of extending the cherry season.



FIG. 27.—A small irrigated orchard in which the water is distributed by the furrow system. The furrows receive the water from a cross furrow or head ditch which extends along the upper side of the tract.

Most varieties of sweet cherries are sterile with regard to their own pollen, and some of the varieties, unlike most other kinds of fruits in which self-sterility is common, are sterile with each other. In most of the districts in which both sweet and sour varieties are planted together, there appears to be little difficulty with regard to the satisfactory fruiting of the sweet varieties; but in districts 13 and 14 and in some parts of district 12, where sour cherries are rarely planted and in which the sweet cherry is of great importance, the trees frequently do not bear well, owing probably to self-sterility or to the sterility between different varieties.

It has been determined by the Oregon Agricultural Experiment Station that the Tartarian and Republic will cross-fertilize most other sweet varieties.

APRICOT VARIETIES.

Apricots are suggested only for districts 12, 13, and 14. On account of the fact that they habitually blossom very early in the spring and are, therefore, extremely subject to injury by frosts, they are not adapted to growing generally throughout the United States.

QUINCE VARIETIES.

A single variety, the Orange, comprises most of the quinces that are grown throughout the country. This fruit succeeds best in the northern districts.

The Rea and Champion are planted occasionally and ripen after the Orange. The Van Deman is sometimes reported from the South.

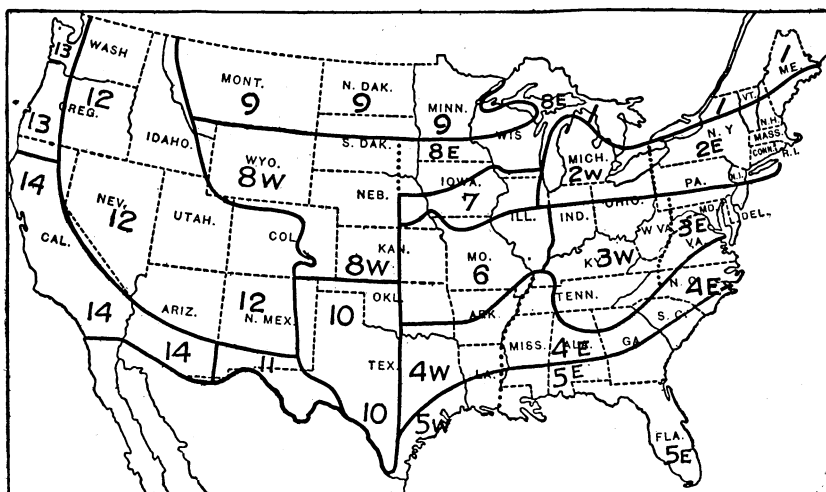


FIG. 28.—Map of the United States, showing the districts into which the country is divided for use in applying the fruit-variety lists.

The Pineapple variety should be planted in home gardens in the Pacific Coast States.

BLACKBERRY VARIETIES.

In the list of blackberries for the western section of districts 4 west and 5 west the McDonald is followed by the word "self-sterile"; the Dallas or the Haupt may be used to pollinate it. In the list for district 14 the Mammoth is similarly designated; the Logan may be used to pollinate it.

STRAWBERRY VARIETIES.

The flowers of strawberry plants are classed as perfect or imperfect according to whether they have both pistils and stamens or pistils only. The imperfect-flowered varieties are usually set with perfect-

flowered ones, two rows of the former alternating with one row of the latter. In order to indicate the sorts that do not bear fruit when set alone the abbreviation "imp." has been placed in parentheses after the name of each imperfect-flowered variety in the lists for different districts.

AGE OF BEARING.

Not infrequently amateur fruit growers expect fruit from their trees much sooner after planting than they should, and disappointment is inevitable. The statements that follow concerning the age at which different fruits bear will serve as a general guide. The age of a tree is usually reckoned from the time it is planted in its permanent place.

Apple trees should begin to bear, as a rule, when they have been planted six to eight years. Certain varieties, as the Yellow Transparent and Wagener, may bear considerably younger, and others, such as the Northern Spy and Yellow Newtown, not until they are somewhat older. Individual trees of the same variety vary somewhat in this respect.

Pear trees bear, in general, at about the same age as apple trees, though perhaps a little younger.

Peach trees under favorable conditions often bear at three years of age, and in any event they should bear at four years unless injured by frost or otherwise.

Plums vary considerably according to the group to which they belong, but most sorts begin to bear in four or five years after planting.

Sour cherries ordinarily begin to bear in about four years and sweet cherries at six or seven years after planting.

Apricots come into bearing at about the same age as peaches, or sometimes a little later.

Quinces are usually five or six years old before they bear much fruit.

Raspberries, blackberries, and dewberries, if planted in the spring, should bear a light crop the next year. Strawberries planted in the spring or early enough in the autumn to make a good growth before the advent of cold weather should produce a good crop the next season.

Currants and gooseberries commonly bear a few fruits the third season after planting.

Grapes may bear very lightly the third season where conditions are favorable, but not much fruit should be expected earlier than the fourth year.

LISTS OF VARIETIES FOR DIFFERENT DISTRICTS.

DISTRICT 1.

Varieties marked with an asterisk (*) are of special importance for the colder sections of the district. For an explanation of the abbreviations used in connection with peaches, see under "Peach varieties" (p. 30); under strawberries the abbreviation imp. = imperfect. A synonym is shown by printing the name in *italic type* in parentheses.

Apples.—Early: Yellow Transparent, *Oldenburg (*Duchess*), Tetofski, Peach (*Peach of Montreal*). Midseason: *Wealthy, *Dudley, Fameuse. Winter: McIntosh, Bethel, *Scott Winter, Tolman (sweet).

Pears.—Flemish (in milder sections), Clapp Favorite (in milder sections).

Peaches.—Planting not advised.

Plums.—Arctic (*Moore Arctic*), De Soto, Forest Garden, Wolf, Cheney.

Cherries.—Richmond, Montmorency.

Raspberries.—Herbert,¹ Ranere (*St. Regis*).¹

Blackberry.—Snyder.¹

Dewberries.—Planting not advised.

Currants.—Perfection (red), White Imperial.

Gooseberry.—Downing.

Strawberries.—Dunlap, Warfield (imp.), Progressive.

Grapes.—Planting not advised.

DISTRICT 2.

EAST AND WEST AS A WHOLE.

The following varieties are suggested for all of district 2, aside from the exception noted:

Apples.—Early: Yellow Transparent, Early Harvest, Oldenburg, Pimate, Williams, Jefferis, Benoni, Maiden Blush, Gravenstein. Midseason: Wealthy, Ramsdell (sweet), Fall Pippin, Mother, Hubbardston. Winter: McIntosh, Tompkins King, Tolman (sweet), Rhode Island Greening, White Pippin, Baldwin, Northern Spy.

Pears.—Giffard, Tyson, Bartlett, Seckel, Howell, Bose, Anjou, Lawrence, Winter Nelis.

Peaches.—Greensboro (w fc), Carman (w fc), St. John (y f), Champion (w fc), Reeves (y f), Oldmixon Free (w f), Elberta (y f), Late Crawford (y f), Chairs (y f), Stevens (w f), Smock (y f).

Plums.—Bradshaw, Lombard, Diamond, Reine Claude (*Green Gage*), Grand Duke, Archduke, Jefferson, Monarch, Middleburg, Italian (prune), Shropshire (damson), French (damson). Japanese varieties: Red June, Abundance, Burbank, Chabot.

Cherries.—Sour varieties: Richmond, Montmorency, English Morello. Sweet varieties: Tartarian, Spanish, Windsor.

Raspberries.—Cuthbert (red), Golden Queen (yellow), Cumberland (black), Columbian¹ (purple).

Blackberries.—Eldorado (except along northern border in New England), Snyder, Mersereau.

Dewberry.—Lucretia.

Currants.—Perfection (red), White Imperial.

Gooseberry.—Downing.

Strawberries.—Early: Dunlap. Late: Belt (*William Belt*), Sample (imp.).

Grapes.—White: Diamond, Empire State, Niagara, Winchell. Red: Brighton, Brilliant, Delaware, Salem. Black: Concord, Ives, Moore, Worden.

EAST AND WEST SEPARATELY.

The following varieties are suggested for district 2, east: *Gooseberry*—Columbus (European); *raspberries*—Herbert, Marlboro (both red), and Farmer (black); *strawberry*—Marshall (early). For district 2, west: *Currant*—London (red); *raspberry*—King (red); *strawberry*—Bubach (imp.).

¹ Hardy in the more favorable parts of this area.

DISTRICT 3.

EAST AND WEST AS A WHOLE.

The following varieties are suggested for all of district 3, aside from the exceptions noted:

Apples.—Early: Yellow Transparent, Early Harvest, Early Ripe, Red June, Williams, Benoni, Horse, Maiden Blush, Wealthy. Midseason: Smokehouse, Bonum, Delicious, Grimes, Kinnard. Winter: York Imperial, Rome Beauty, White Pippin, Stayman Winesap, Winesap, Royal Limbertwig.

Pears.—Bartlett (in Pennsylvania, Ohio, and Indiana only), Seckel, Kieffer.

Peaches.—Mayflower (w c), Early Wheeler (w c), Greensboro (w fc), Arp (y c), Carman (w fc), Hiley (w fc), Belle (w fc), Ray (w fc), Reeves (y f), Elberta (y f), Frances (y f), Late Crawford (y f), Chairs (y f), Smock (y f), Levy (y c), Salwey (y f).

Plums.—Native and hybrid varieties: America, Forest Rose, Gonzales, Milton, Miner, Munson, Newman, Poole Pride, Pottawattamie, Robinson, Whitaker, Wildgoose. Japanese varieties¹: Red June, Abundance, Burbank, Chabot. European varieties (for higher elevations): Bradshaw, Jefferson, Gneii, Reine Claude (*Green Gage*), German (prune), Italian (prune), Shropshire (damson), French (damson).

Cherries.—Same as for district 2, but with decreasing value southward.

Raspberries.—Cuthbert (red), Golden Queen (yellow), Cumberland (black), Columbian (purple).

Blackberries.—Early Harvest, Eldorado, Evergreen (in New Jersey only).

Dewberry.—Lucretia.

Currants.—Perfection (red), White Imperial.

Gooseberry.—Downing.

Strawberries.—See below.

Grapes.—White: Diamond, Niagara, Winchell. Red: Brighton, Brilliant, Delaware. Black: Concord, Moore, Worden.

EAST AND WEST SEPARATELY.

The following varieties are suggested for district 3, east: *Gooseberry*—Columbus (European); *raspberry*—Ranere (red); *strawberries*—Premier (early), Success (early), Joe (late), Chesapeake (late); *grapes*—Elvira (white), Lutie (red), Ives (black). For district 3, west: *Currant*—London (red); *dewberry*—Mayes (*Austin*); *raspberry*—King (red); *strawberries*—Dunlap, Bubach (imp.) (both varieties except in Tennessee and southward), Thompson (in Tennessee and southward), Aroma (throughout section); *grapes*—Martha (white), Catawba (red), Carman (black).

DISTRICT 4.

EAST AND WEST AS A WHOLE.

Apples.—Early: Yellow Transparent, Red June, Early Harvest, Red Astrachan, Horse, San Jacinto, Bledsoe. Midseason: Bonum, Kinnard. Winter: Winesap, Texas Red, Yates, Terry.

Pears.—Kieffer (with Le Conte or Garber).

Peaches.—Same as for district 3, though the late varieties should probably be omitted.

Plums.—Same as for district 3.

Cherries.—Planting not advised.

Japanese persimmons.—See district 5.

Figs.—See district 5.

EAST SEPARATELY.

Raspberry.—Ranere (above 500 feet altitude).

Blackberry.—Early Harvest (above 500 feet altitude).

Dewberry.—Lucretia.

Strawberries.—Klondike, Missionary, Thompson.

Currants and *gooseberries*.—Planting not advised.

¹ The Japanese varieties have proved unreliable in southwestern Pennsylvania.

Grapes.—White: Diamond, Empire State, Elvira, Niagara. Red: Agawam, Brighton, Brilliant, Delaware. Black: Concord, Carman, Moore, Diamond. Along the Atlantic coast and extending about 100 miles inland the varieties of the Muscadine group of grapes also succeed. These include Thomas, James, Eden, Flowers, Mish, and Scuppernong.

WEST SEPARATELY.

Blackberries.—Early Harvest, Dallas, McDonald (self-sterile), Haupt.

Dewberry.—Mayes (*Austin*).

Strawberries.—Klondike, Thompson.

Raspberries, currants, and gooseberries.—Planting not advised.

Grapes.—White: Gold Coin, Wapanuka, Winchell, Rommel. Red: Headlight, Brilliant, Brighton, Last Rose. Black: Husmann, Fern (*Fern Munson*), Moore, Carman.

DISTRICT 5.

EAST AND WEST AS A WHOLE.

Apples.—Planting not advised.

Pear.—Kieffer (with Le Conte or Garber).

Peaches.—Jewel (y f), Honey (w f), Imperial (w f), Pallas (w f), Waldo (w f), Florida Gem (w f), Climax (w f), Colon (w f), Triana (w f), Angel (w f), Hall Yellow (y f), Cabler (r c), Estella (y f), Onderdonk (y f).

Plums.—Six Weeks, Excelsior, Terrell, America, Poole Pride. Japanese varieties: Red June, Abundance, Burbank, Kelsey.

Cherries.—Planting not advised.

Japanese persimmons.¹—Tanenashi, Hachiya, Hyakume, Okame, Triumph, Tamopan, Eureka, Zengi, Costata, Ormond, Gailey,² Masugata.²

Figs.—Celeste,³ Turkey³ (*Brown Turkey*), Brunswick, Ischia, Lemon, Magnolia.⁴

Grapes.—White: Wapanuka, Hidalgo, Niagara, Krause. Red: Brighton, Captivator, Agawam, Valhalla. Black: R. W. Munson, Cloeta, Carman, Champenel. The varieties of the Muscadine group named under district 4, east, are also adapted to most parts of district 5. By adopting special methods of training and by grafting on resistant stocks, certain varieties of Vinifera or European grapes have been grown with some success. However, they are not recommended for general planting in this district.

EAST SEPARATELY.

Raspberries, blackberries, dewberries, currants, gooseberries, and strawberries.—Same as for district 4, east.

WEST SEPARATELY.

Raspberries, blackberries, dewberries, currants, gooseberries, and strawberries.—Same as for district 4, west.

DISTRICT 6.

Apples.—Early: Yellow Transparent, Early Harvest, Red June, Oldenburg, Benoni, Maiden Blush, Wealthy. Midseason: Grimes, Jonathan, King David, Delicious. Winter: York Imperial, Stayman Winesap, Winesap, Ingram.

¹ Comparatively little definite information exists in regard to the range of adaptability of different persimmon varieties. This list includes the principal sorts that are planted in the South Atlantic and Gulf States. Tanenashi is probably grown more extensively at present than any other sort. The Eureka has proved especially hardy and desirable in Erath County, Tex., about 60 miles southwest of Fort Worth, and also at one or two points considerably farther north. The Tamopan is a Chinese variety and may possess a greater degree of hardness than was formerly supposed. Zengi is one of the earliest varieties. Costata and Ormond may be too late for growing in most parts of district 4.

² Gailey and Masugata are not of much value for their fruit, but, unlike the other varieties, the trees have both pollen-bearing and fruit-producing blossoms. As a rule, these two types of blossoms are borne on separate trees. While some varieties produce fruit without pollination, others do not; hence, in planting any large number of persimmons it is advisable to include a pollen-producing sort.

³ The Celeste is regarded as the hardest variety of this group, with Turkey perhaps only slightly less hardy. The former is much more widely planted than any of the others in the list. These two sorts should be planted in district 4 in preference to the others, unless possibly in a few especially favorable localities.

⁴ The Magnolia is planted in the Gulf coast region of Texas nearly to the exclusion of other varieties. It is not satisfactory in other parts of district 5, except possibly in the southwestern part of Louisiana.

Pears.—Bartlett, Seckel, Anjou, Kieffer.

Peaches.—Early Wheeler (w c), Greensboro (w fc), *Arp* (y c), Carman (w fc), Hiley (w fc), Belle (w fc), Family Favorite (w fc), Elberta (y f), Stevens (w f), Stump (w f), Smock (y f).

Plums.—Native and hybrid varieties: De Soto, Miner, Surprise, Terry, Whitaker, Hawkeye, Pottawattamie, Golden (*Gold*), Brittlewood, Emerald. Japanese varieties: Red June, Abundance, Burbank.

Cherries.—Richmond, Montmorency.

Raspberries.—King (red), Pearl (black), Cardinal (purple).

Blackberries.—Mersereau, Eldorado, Early Harvest.

Dewberries.—Lucretia, Mayes (*Austin*).

Currants.—Perfection (red), London (red), White Imperial.

Gooseberries.—Downing, Oregon.

Strawberry.—Dunlap.

Grapes.—White: Winchell, Diamond, Noah, Elvira. Red: Brilliant, Lutie, Catawba, Brighton. Black: Moore, Concord, Worden, Bacchus.

DISTRICT 7.

Apples.—Early: Yellow Transparent, Livland Raspberry, Oldenburg, Charlamoff, Whitney, Benoni, Dyer. Midseason: Wealthy, Brilliant, Patten, Ramsdell (sweet), Roman Stem. Winter: Banana, White Pearmain, Northwestern, Black Annette, Delicious, Tolman (sweet), Windsor, Stayman Winesap, Ralls.

Pears.—Flemish, Bartlett, Seckel, Kieffer.

Peaches are uncertain at the best in this district. In favorable seasons the following varieties would probably fruit in some sections: Greensboro (w fc), Champion (w f), Bailey (w fc), Crosby (y f), Wright (w fc), Russell (w f), Bokhara (w f), Lone Tree (y f).

Plums.—Forest Garden, Stoddard, Wolf, Surprise, Rockford, Hawkeye, Terry, De Soto, Wyant, Miner, Emerald, Brittlewood.

Cherries.—Timme, Richmond, Montmorency.

Raspberries.—King (red), Sunbeam (red), Minnesota No. 4 (red), Older (black), Columbian (purple).

Blackberries.—Eldorado, Snyder.

Dewberries.—Planting not advised.

Currants.—Perfection (red), London (red), White Imperial.

Gooseberries.—Downing, Carrie.

Strawberries.—Dunlap, Warfield (imp.), Progressive.

Grapes.—White: Diamond, Niagara, Noah, Winchell. Red: Brighton, Catawba, Lutie, Woodruff. Black: Concord, Ives, Moore, Worden.

DISTRICT 8.

EAST AND WEST AS A WHOLE.

Apples.—Early: Yellow Transparent, Livland Raspberry, Oldenburg, Iowa Beauty, Benoni. Midseason: Wealthy, McMahan, Anisim, Wolf River, Utter, Peerless, Plumb Cider. Winter: McIntosh, Patten, Northwestern, Jewell Winter, Milwaukee, Scott Winter, Malinda.

Pears.—Flemish, Warner.

Peaches.—Planting not advised.

Plums.—De Soto, Forest Garden, Cheney, Wolf, Wyant, Stoddard, Surprise, Rollingsstone, Waneta. Sand cherry-plum hybrids: Compass, Hanska, Sapa, Opata, Sansota, Cheresota, Wachampa.

Cherries.—Timme, Richmond, Montmorency.

EAST SEPARATELY.

Raspberries, blackberries, dewberries, currants, gooseberries, and strawberries.—Same as for district 7, except that the Columbian raspberry should be omitted.

Grapes.—White: Diamond, Niagara, Noah, Winchell. Red: Brilliant, Delaware, Merrimac, Woodruff. Black: Concord, Ives, Moore, Worden.

WEST SEPARATELY.

The same varieties of currants and gooseberries are suggested as for district 7. On account of limited precipitation, raspberries, blackberries, and strawber-

ries are not likely to be very satisfactory in district 8, west, except under irrigation. If water can be applied, and perhaps winter protection given, the same varieties as those suggested for district 7 may prove of some value. Conditions are similar with reference to grapes. No varieties can be recommended for this section with confidence of success, but where irrigation and winter protection can be given the following may be worth trying: White—Diamond, Lady, Martha, Niagara; red—Agawam, Catawba, Delaware, Vergennes; black—Concord, Hartford, Isabella, Worden.

DISTRICT 9.

Apples.—Oldenburg (*Duchess*), Patten, Okabena, Hibernial.

Pears.—Planting not advised.

Peaches.—Planting not advised.

Plums.—The list for district 8 contains the varieties of most importance for district 9. The sand cherry-plum hybrids are also of value in many sections of district 9.

Cherries.—The varieties named for other districts are not likely to be hardy, as a rule, in this district. Sand cherries, however, are of value for jellies, etc. Buffalo berries and other native wild fruits are also used for jelly making.

Currants.—Perfection (red), London (red), White Imperial.

Gooseberries.—Downing, Carrie.

Strawberries.—With winter protection: Dunlap, Warfield (imp.), Progressive.

Raspberries, blackberries, and dewberries.—Planting not advised.

Grapes.—The conditions are not well adapted to grape growing, and only the very hardy sorts are likely to succeed even in the more favorable locations. The ones suggested for trial are Alaska, Beta No. 1, Beta No. 2, Beta No. 3, Bicolor, Dakota, and Janesville.

DISTRICT 10.

Apples.—Early: Yellow Transparent, Red June, San Jacinto, Maiden Blush, Gravenstein, Wealthy. Midseason: Grimes, Jonathan, Kinnard. Winter: Northwestern, Texas Red, Winesap, Missouri, Arkansas Black, Ralls, Limbertwig.

Pears.—Bartlett, Seckel, Kieffer.

Peaches.—Alexander (w c), Sneed (w c), Triumph (y c), Arp (y c), Carman (w fc), Mamie Ross (w fc), Chinese Cling (w c), Elberta (y f), Lee (*General Lee*) (w c), Krummel (y f), Heath (w c).

Plums.—Six Weeks, De Soto, Golden (*Gold*), America, Hammer, Poole Pride, Pottawattamie, Laire, Robinson, Wayland, Whitaker, Wildgoose, Wolf, Wooten,

Cherries.—Richmond, Montmorency.

Raspberries.—Of doubtful value.

Blackberries.—Crandall, Early Harvest.

Dewberry.—Mayes (*Austin*).

Strawberries.—Klondike, Arizona, Michael.

Blackberries, dewberries, and strawberries are likely to fail in district 10 without irrigation, on account of limited precipitation.

Currants and gooseberries.—The same varieties listed for district 7 are suggested for trial in district 10.

Grapes.—White: Hidalgo, Krause, Rommel, Wapanuka. Red: Captivator, Ellen Scott, Headlight, Marguerite. Black: Bailey, Champenel, Fern, Husmann.

DISTRICT 11.

Apples.—Early: Yellow Transparent, Early Harvest, Red June, Maiden Blush. Midseason: Wealthy, Grimes, Jonathan, Delicious. Winter: Winesap, Missouri, Rome Beauty, Arkansas Black, White Pearmain.

Pears.—Bartlett, Seckel, Kieffer.

Peaches.—Alexander (w c), Triumph (y c), Greensboro (w fc), Carman (w fc), Ray (w fc), Texas (*Texas King*) (w fc), Mamie Ross (w fc), Belle (w fc), Elberta (y f), Late Crawford (y f), Crothers (w fc), Krummel (y f), Salway (y f).

Plums and cherries.—Very few grown. Probably the varieties suggested for district 10 would furnish satisfactory supplies for home use.

Little information exists concerning the adaptability of bush-fruit varieties to this district.

Raspberries.—Of rather doubtful value.

Blackberries, dewberries, and strawberries.—The varieties named for district 10 are suggested for district 11.

Currants and gooseberries.—The varieties named for district 12 are suggested for trial in district 11.

Grapes.—No very definite suggestions are possible with reference to varieties. In some places along the Pecos River and the Rio Grande a few Old World varieties are grown, of which the Mission is the principal one. Sultanina, Sultan, Muscat, Alexander, and Black Hamburg might succeed, but all of these varieties should probably have winter protection.

DISTRICT 12.

Apples.—Early: Yellow Transparent, Red June, Red Astrachan, Early Harvest, Gravenstein. Midseason: Grimes, Jonathan, Ortley, Wagener. Winter: Delicious, Rome Beauty, Banana, Stayman Winesap, Winesap, White Pearmain, Arkansas (*Mammoth Black Twig*), Arkansas Black.

In some of the irrigated valleys in Washington the Esopus and Yellow Newtown are also grown, but they do not occur as widely as most of the varieties named in the above list. The McIntosh is one of the most important varieties in the Bitter Root Valley in Montana.

Pears.—Bartlett, Flemish, Anjou, Winter Nelis.

Peaches.—Alexander (w c), Early Hale (w fc), Early Crawford (y f), Elberta (y f), Muir (y f), Late Crawford (y f), Lovell (y f).

Plums.—Japanese varieties: Red June, Abundance, Burbank, Wickson, Satsuma. European varieties: Bradshaw, Lombard, Reine Claude (*Green Gage*), Peach, Columbia, Washington, Yellow Egg, Pond.

Prunes.—Italian, Silver, Agen (French), Hungarian, German, Tragedy.

Cherries.—Sour varieties: Richmond, Montmorency. Sweet varieties: Tartarian, Bing, Napoleon (*Royal Ann*), Republican, Lambert.

Apricots.—Moorpark, Blenheim, Royal, Tilton. Apricots habitually blossom very early in the spring; hence the blossoms are often killed by frosts except in very favorable localities.

Raspberries.—Marlboro, Cuthbert.

Blackberries.—Eldorado, Lawton, Snyder, Logan (in the milder valleys of Idaho, Oregon, and Washington).

Dewberry.—Lucretia.

Currants.—Perfection (red), White Imperial.

Gooseberries.—Oregon, Poorman.

Strawberries.—Dunlap, Jucunda (in Colorado and Utah), Clark, Superb.

Grapes.—In the milder portions of district 12, especially in the southern part, some of the Vinifera, or Old World, varieties may be grown, the Sultanina being the favorite one. In some parts of Idaho and Oregon, with winter protection, the more hardy varieties of the Old World grapes have given fairly good results. These include such sorts as the Black Hamburg, Chasselas de Fontainebleau, Flame Tokay, Jura Muscat, Sylvaner, and Zinfandel. American varieties suggested for trial planting in this district are Diamond, Niagara, Winchell, Brighton, Delaware, Concord, Isabella, and Worden.

DISTRICT 13.

Apples.—Most of the varieties in the list for district 12 occur widely in district 13. However, in the Puget Sound region such varieties as Alexander, Tompkins King, McIntosh, Rhode Island Greening, Baldwin, and Northern Spy, together with Gravenstein and Wagener of the list named for district 12, are relatively the most important sorts. Most of the above-named sorts also are grown to a limited extent in other parts of district 13 as well as at the lower altitudes in the eastern part of Oregon.

Pears.—Bartlett, Howell, Bosc, Anjou, Comice, Winter Nelis.

Peaches, plums, prunes, apricots, and cherries.—Substantially the same as for district 12.

Raspberries.—Cuthbert (red), Antwerp (red), Golden Queen (yellow).

Blackberries.—Eldorado, Snyder, Evergreen, Logan.

Dewberries.—Lucretia, Gardenia.

Currants.—Perfection (red), White Imperial.

Gooseberry.—Oregon.

Strawberries.—Gold Dollar (early), Marshall, Magoon, Oregon, Clark (for canning), Superb.

Grapes.—Conditions in western Washington are not favorable for grape growing. In western Oregon the same varieties suggested for district 12 may be grown without winter protection.

DISTRICT 14.

Apples.—While there is considerable difference in the adaptability of varieties to the different sections of California, those named in the list for district 12 have a wide range of adaptability and comprise the most important ones grown in district 14, aside from the Yellow Bellflower and Yellow Newtown, which are grown largely in the Pajaro Valley, and the Gravenstein, which is produced in large quantities about Sebastopol, in Sonoma County. These three varieties make up a large proportion of the commercial apple industry of California.

Pears.—Bartlett, Howell, Bosc, Anjou, Comice, Winter Nellis.

Peaches.—Alexander (w c), Triumph (y fc), Early Hale (w fc), Early Crawford (y f), Tuskena¹ (y c), Foster (y c), Decker (w f), Elberta (y f), Muir² (y f), McKeivitt (w c), Late Crawford (y f), Lovell² (y f), Phillips¹ (y c), Salwey (y f).

Plums.—Yellow Egg, Washington, Jefferson, Grand Duke, Climax, Clyman, Wickson, Kelsey, Burbank, Satsuma.

Prunes.—Agen (French), Sugar, Imperial, Sergeant (*Robe de Sergeant*), Silver.

Cherries.—Chapman, Tartarian,³ Napoleon (*Royal Ann*), Bing, Republican,⁴ Lambert.

Apricots.—Moorpark, Blenheim, Hemskirk, Royal, Tilton.

Figs.—Adriatic, Ischia, Mission, Marseillaise, Smyrna type.⁴

Japanese persimmons.—Goshio, Hachiya, Hyakume, Tanenashi, Yemon.

Raspberries.—Cuthbert (northern California), Surprise (southern California).

Blackberries.—Mammoth (self-sterile), Logan, Himalaya, Lawton (northern California), Crandall (southern California and Arizona).

Dewberry.—Gardenia.

Currant.—Perfection (northern coast section).

Gooseberry.—Oregon (northern coast section).

Strawberries.—Marshall (Fresno and northward), Oregon (Fresno and northward), Brandywine (southern California only), Arizona (in Arizona).

Grapes.—In this district the Vinifera, or Old World, varieties are grown nearly to the exclusion of American sorts. On account of the destructiveness of the phylloxera it is necessary to propagate the vines on stocks or roots that are resistant to that insect except in the case of the "direct producers," which are themselves resistant to the phylloxera.

The following varieties are named for district 14, and especially for California northward from a region somewhat south of Los Angeles: White—Alexandria, Green Hungarian, Palomino, Sultanina; red—Aramon, Flame Tokay, Barbarossa, Chasselas de Fontainbleau; black—Bellino, Gross Colman, Muscat Hamburg, Zinfandel.

¹ Used largely for canning.

² Though used for canning and for shipping fresh, Muir and Lovell are of importance largely for drying.

³ See comment on p. 31 concerning the self-sterility and intersterility of sweet cherry varieties.

⁴ Several varieties of figs of the Smyrna type are grown in district 14. In parts of California they are being planted on a large commercial scale. Perhaps the Lob Ingr variety is the one of most importance. Smyrna figs require caprification in order to develop fruit; hence, caprifig trees must be planted with Smyrna figs. The amateur grower not otherwise informed should seek further advice before planting figs of this type. See Department of Agriculture Bulletin 732, entitled "Smyrna Fig Culture."